Accident Analysis and Prevention 98 (2017) 338–347

Contents lists available at ScienceDirect

Accident Analysis and Prevention

journal homepage: www.elsevier.com/locate/aap

Pedestrian self-reported use of smart phones: Positive attitudes and high exposure influence intentions to cross the road while distracted

Alexia Lennon*, Oscar Oviedo-Trespalacios, Sarah Matthews

Centre for Accident Research and Road Safety—Queensland (CARRS-Q), Queensland University of Technology (QUT), K Block, 130 Victoria Park Road, Kelvin Grove 4059, Australia

ARTICLE INFO

Article history:
Received 9 March 2016
Received in revised form
14 September 2016
Accepted 25 October 2016

Keywords:
Young people
Mobile phone distraction
Theory of Planned Behaviour
Distracted pedestrians
Crossing behaviour

ABSTRACT

Pedestrian crashes are an important issue globally as pedestrians are a highly vulnerable road user group, accounting for approximately 35% of road deaths worldwide each year. In highly motorised countries, pedestrian distraction by hand held technological devices appears to be an increasing factor in such crashes. An online survey (N = 363) was conducted to 1) obtain prevalence information regarding the extent to which people cross the road while simultaneously using mobile phones for potentially distracting activities; 2) identify whether younger adult pedestrians are more exposed to/at risk of injury due to this cause than older adults; and 3) explore whether the Theory of Planned Behaviour (TPB) might provide insight into the factors influencing the target behaviours. Self-reported frequency of using a smart phone for three levels of distraction (visual and cognitive-texting/internet; cognitive only- voice calls; audio only-listening to music) while crossing the road was collected. Results indicated that about 20% of the sample had high exposure to smart phone use while crossing, especially 18–30 year olds who were significantly more likely than other age groups to report frequent exposure. TPB constructs of Attitude, Subjective Norm, and Perceived Behavioural Control significantly predicted intentions to use a smart phone while crossing the road, accounting for 62% of variance in Intentions for the entire sample, and 54% of the variance for 18–30 year olds. Additional variables of Mobile Phone Involvement and Group Norms provided an additional significant 6% of the variance explained for both groups. Attitude was by far the strongest predictor for both the whole sample and for 18–30 year olds, accounting for 38% and 41% explained variance, respectively. This suggests that pedestrians with positive attitudes towards using their smart phones while crossing the road have stronger intentions to do so. Moreover, high exposure was associated with stronger intentions to use a smart phone while crossing, and the effect was large, suggesting high frequency mobile phone use may lead to riskier habits, such as failing to interrupt use while crossing the road. Interventions should target pedestrians under 30 years old and aim to strengthen negative attitudes towards using smart phones while crossing, or to challenge the perceived advantages or emphasise the disadvantages of using one's phone while crossing in order to reduce intentions to do so. Young people's perceptions that others in their social group approve of smart phone use while crossing could also be an important factor to address.

1. Introduction

World-wide, pedestrian injury is a significant burden on health and a major cause of death and disability in the most productive members of a community: those aged under 45 years (WHO, 2015). Though the proportion of deaths to pedestrians in Australia is lower than that of many less motorised countries (WHO, 2015), pedestrians still represent approximately 14% of road fatalities, accounting for 2022 deaths during 2003–2012 (calculated from data reported in BITRE, 2013). Pedestrians aged 17–25 years form the second largest proportion of these fatalities (BITRE, 2015) and are thus an important sub-group and worthy of specific attention to reduce their risk.

Crossing or walking along roads forms a minor part of total walking, but presents the highest risk because of the potential interaction with motor vehicles. Moreover, crossing the road is a complex exercise with relatively high demand on perceptual and cognitive capacity. Even for pedestrians who can successfully integrate the required information under normal circumstances, distraction (e.g. from hand-held technological devices) can

* Corresponding author.
E-mail address: alexia.j.lennon@gmail.com (A. Lennon).

http://dx.doi.org/10.1016/j.aap.2016.10.028
0001-4575/

interfere with the decision making process at a range of points: Pedestrians may fail to notice important auditory or visual information, make incorrect judgements of speed (especially where multiple lanes or vehicles are involved), make an incorrect attribution of driver intention, or misjudge their own ability to get across in a given gap. Distraction therefore has the potential to exacerbate crash risk for pedestrians.

Mobile phone use is now commonplace in Australia, especially among the young, with the majority of 18–24 year old Australians (94%) using a mobile phone (Australian Bureau of Statistics, 2013; Department of Broadband Communications and Digital Economy, 2008). Increasingly these are 'smart' type phones (Deloitte, 2014), enabling pedestrians to listen to music, make voice calls and send text message while they are 'on the move', as well as access the internet for email, social media and satellite navigation.

It is therefore unsurprising that the prevalence of pedestrian distraction by hand held technological devices appears to be increasing, with observational studies showing that up to 40% of pedestrians appear distracted when crossing the road (Ferguson et al., 2013; Thompson et al., 2013). Moreover, mobile phone-related injuries have been found to be higher for people under the age of 31 years (Nasar and Troyer, 2013; Nieuwesteeg and McIntyre, 2010) and particularly high among teens (Ferguson et al., 2013) suggesting that younger pedestrians may be at greater risk of crashes. While observational studies can reveal much about actual behaviour, they cannot shed light on psycho-social factors that may influence behaviour. As use of a mobile phone while walking or crossing the road is a voluntary behaviour, psycho-social factors are important to understanding the motivations that underpin it and to informing interventions to reduce this risky behaviour. Thus the current study focussed on such factors.

Previous research has suggested that distraction can be of different types, including audio, visual, cognitive and physical (Young and Salmon, 2012) with differing levels of influence over ability to carry out attention-demanding tasks (Engstrom et al., 2005; Wickens, 2008) such as driving or pedestrian tasks. Pedestrians distracted by mobile phones may be at increased risk of collisions, with simulated crossing studies showing that pedestrians using mobile phones for talking (Thompson et al., 2013; Bungum et al., 2005; Hatfield and Murphy, 2007) or texting (Masuda et al., 2014) walk more slowly, change directions more frequently, are less likely to acknowledge other people, look left and right fewer times, are less likely to look at traffic before starting to cross, and make more errors than pedestrians who are not distracted, even after controlling for age and familiarity with the task.

Listening to music with headphones may represent a different type of distraction from that of using a mobile phone for talking or texting/browsing. Results from simulator experiments on pedestrian distraction and divided attention suggest that listening to music on a portable device is less risky than talking on a mobile phone (Hyman et al., 2010) even in hands- free mode (Neider et al., 2010). An explanation for this is that pedestrians may compensate for their audio distraction: one observational study found that pedestrians using personal music devices demonstrated either the same amount or greater cautionary behaviours (such as looking before crossing) than pedestrians without music devices (Walker et al., 2012). Moreover, there has been some evidence that pedestrians may be more likely to listen to music on a mobile device while crossing the road than they are to undertake other forms of distracting task such as texting (Williamson and Lennon, 2015). However, findings have been mixed. One simulator-based study found that listening to music was just as likely as texting to cause a 'hit' (hypothetical crash), and both were more risky than calls (Schwebel et al., 2012). As the study involved the participant manipulating the device to select music while in the roadway, rather than audio distraction alone (listening), this might have affected the level of demand of the task, making it more distracting and thus equivalent to texting.

1.1. Theory of Planned Behaviour

Research on pedestrian behaviour is typically not underpinned by a theoretical framework, though such work is beginning to emerge (e.g Diaz, 2002; Bartonet al., 2016). The Theory of Planned Behaviour (TPB; Ajzen, 1991) was selected for this study in order to seek greater insight into the factors influencing, or motivations underpinning, pedestrian distraction while crossing. The voluntary nature of the target behaviour makes it likely that intention to use or not use one's smart phone might influence future behaviour, and thus the TPB seemed especially appropriate. Moreover, the TPB is a well-validated decision-making model that has been used successfully in recent road-safety studies to explain and predict people's intentions and subsequent behaviours in speeding (Lewis et al., 2013), avoiding drink driving (Moan and Rise, 2011), and texting while driving (Gauld et al., 2013).

The central tenet of TPB is that intentions are the most proximal determinant of behaviour. Intentions in turn are influenced or determined by a person's attitudes, subjective norms, and perceptions of behavioural control (PBC) in relation to the particular target behaviour (Ajzen, 1991, 2002). Thus the model consists of three standard constructs: Attitude, Subjective Norm (SN), and PBC, the strength of which determine the strength of one's intentions toward engaging in the behaviour, which are then regarded as proxies for whether people will actually engage in the behaviour. Effective use of the model often attempts to obtain a baseline (past or current) level of the target behaviour and a prospective measure of actual behaviour over a specific time period (e.g. 'the next two weeks') to allow for analysis of the relationship between reported intention and behaviour, though measures are usually self-reported.

Several studies have used TPB constructs, and extended versions of it, to explain impaired pedestrian behaviour or explore risky crossing decisions using hypothetical crossing scenarios (Diaz, 2002; Gannon et al., 2014; Haque et al., 2012; Zhou et al., 2009; Zhou and Horrey, 2010). Perceived Behavioural Control has generally been found to be the strongest contributor to the explained variance in such studies (Barton et al., 2016). Previous studies utilising hypothetical crossing scenarios have found that the TPB, particularly subcomponents of perceived behavioural control and attitude, is useful in explaining intentions to violate road regulations (Diaz, 2002) or to cross the road under risky conditions (Evans and Norman, 2003; Zhou and Horrey, 2009). More recently, intentions to cross while distracted by a mobile phone have also been examined using the TPB (Barton et al., 2016). These researchers presented participants with four scenarios of crossing the road while distracted by one of texting, listening to music, receiving a voice call or using an application on their mobile phone. Results were that participants had significantly more positive attitudes, subjective norms, perceived behavioural control and intentions in relation to listening to music while crossing the road compared to the other types of distracting activity. Regression analyses of TPB variables on behavioural intentions to cross the road while distracted revealed that, consistent with other TPB studies, perceived behavioural control was a significant and strong positive predictor, with attitude being the second and much weaker predictor.

While results of the Barton et al. (2016) study are informative, the sample used in their study was fairly small (n = 80) and based on presenting participants with a hypothetical scenario rather than asking about their typical behaviour. Thus pedestrians may not have been responding in ways that reflect their actual level of risk. The aims of the current study, described below, extend Barton et al.'s work by obtaining an estimate of exposure to distracted